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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/384,971 08/30/99 KUBOTA

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EXAMINER

BROOKE, M

ART UNIT

PAPER NUMBER

2853

DATE MAILED:

05/23/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/384,971

Applicant(s)

KUBOTA ET AL.

Examiner

Michael S. Brooke

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 6-8 and 16-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 9-15 and 19-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claims ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 18) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Claims 6-8 and 16-18 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 6.

Claim Objections

2. Claim 19 is objected to because of the following informalities: "polycrystalline" is misspelled.. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 3-5, 13-15, 22 and 23 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 3 and 13:

- Claims 3 and 13 recite the language "plural layered protective layers." This language implies that each of the protective layers has plural layers. This is not

taught in the instant spec. It is recommended that this language be changed to "plural protective layers."

- Claims 3 and 13 also recite that "any protective layer of said plural layered protective layers is removed in said second region." This language implies that one or both of the protective layers can be removed. This is not taught in the instant spec. It is recommended that the language be changed to recite "and one of said plural protective layers is removed in said second region."

Claims 22 and 23:

- This claim teaches changing the size of the bubble while "keeping a region of the starting point of bubbling to said second region." This is not taught by the instant spec. With reference to Figs. 4A and 4B, the instant spec. teaches that when one voltage is applied, a bubble is generated over the whole heat generating portion (see spec., p. 27:12-16). When a second, lower, voltage is applied, a bubble is generated only in the second region (see spec. p. 27:17-23). The instant spec. does not teach in the first case, that film boiling starts in the second region.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 3-5, 13-15 and 21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claims 3 and 13:

- It is unclear how a single protective layer is composed of plural layers. It is recommended that Applicant's refer to the "protective layer" as a "protective coating." Also, the language "plural layered protective layers" is unclear, as this language implies that each of the protective layers has plural layers.

Claims 4 and 14:

- "the upper protective layer" and "the lower protective layer" lack antecedent basis.

Claim 21:

- It is unclear how the apparatus provides the head. The is language should be rewritten to say "A liquid discharge apparatus comprising the..." Also, the language "a member for providing said liquid discharge head" is unclear. What is the member and how does it provide a head. For the purposes of examination, the Examiner will interpret "a member" to mean either a top or bottom plate.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1, 2, 9, 21/1 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Shirato et al. (4,339,762).

Shirato et al. teaches an ink jet print head comprising (see Fig. 4) a heat generating layer (403), which discharges ink from an ink discharging port (110). A protective layer (406) is formed over a plurality of heat generating elements. The protective layer has a first region with a substantially uniform thickness and a second region with a substantially uniform thickness that is thinner than the first region. While the thickness of the heating element changes with its length, at any point there is a substantially uniform thickness. The volume of the ink droplet is changed by varying the voltage (col. 7:66-68 and col. 8:1-3). The second region is provided on a side closer to the orifice (col. 7:27-30 and 55). While Shirato et al. does not specifically teach that the heat generating element has a positive temperature coefficient, resistors made from transition metal borides (HfB_2) inherently have a positive temperature coefficient (see Swinehart, below). Shirato et al. further teaches a grooved plate (102) which the Examiner interprets to be the same as the claimed "member for providing said liquid discharge head." Shirato et al. further teaches that the varying thickness of the protective layer changes the amount of heat supplied from position to position on the heating surface (407) (col. 3:63-68 and col. 4:1-11). Figs. 2 and 8 illustrate that the bubble formation begins at the location on the protective layer that has the highest surface temperature (see col. 7:42-68 and col. 8:1-24). Therefore, bubble formation begins in the second region.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762), as applied to claims 1, 2, 9, 21/1 and 22 above, and further in view of Shirato et al. (4,392,907).

Shirato et al. teaches the claimed invention with the exception of the protective layer being composed of an upper protective layer and a lower protective layer and the upper protective layer being composed of SiN and a lower protective layer being composed of PSG. The limitations of removing any layer in the second region, forming the second region by forming the upper protective layer after first etching the lower protective layer, and etching with hydrofluoric acid are directed to the method of manufacturing the ink jet head and are not seen to be limiting as to the structure of the ink jet head.

Shirato et al. ('907) teaches (Fig. 4) an ink jet head comprising a first protective layer (9) for the purpose of preventing the contact of the heating resistor with the ink, which would lead to the oxidation of the heating resistor and/or the decomposition of the ink (col. 7:50-54). Shirato et al. further teaches that the protective layer may be a single layer structure or alternatively, may be composed of plural layers (col. 8:30-32). Therefore, Shirato et al. teaches the a protective layer having a single layer structure

and a protective layer having a plural layer structure are art recognized equivalents.

Because these two structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a plural layer structure for the single layer structure taught in Shirato et al. ('762).

It would have been an obvious matter of design choice to provide an with upper protective layer being composed of SiN and a lower protective layer being composed of PSG, since the Applicant has not disclosed that this particular combination of passivation materials solves any stated problem or is for any particular purpose and it appears that the invention would function equally well with the passivation layer taught by Shirato et al, as modified.

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762), as applied to claims 1, 2, 9, 21/1 and 22 above, and further in view of Matsumoto (4,429,321).

Shirato et al. teaches the claimed invention with the exception of a driving circuit having a plurality of function devices fore driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements 911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density as taught by Matsumoto.

12. Claims 11, 12, 21/11 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531).

Shirato et al. teaches the claimed invention, as discussed above, with the exception of a moving member.

Nakata et al. teaches an ink jet print head comprising a moving member (31) for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency , ejection force and ejection speed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., a moving member for the purpose of directing the propagation of the pressure wave toward the ejection outlet, thereby increasing ejection efficiency , ejection force and ejection speed as taught by Nakata et al.

13. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Shirato et al. (4,392,907).

Shirato et al. teaches the claimed invention with the exception of the protective layer being composed of an upper protective layer and a lower protective layer and the upper protective layer being composed of SiN and a lower protective layer being

composed of PSG. The limitations of removing any layer in the second region, forming the second region by forming the upper protective layer after first etching the lower protective layer, and etching with hydrofluoric acid are directed to the method of manufacturing the ink jet head and are not seen to be limiting as to the structure of the ink jet head.

Shirato et al. ('907) teaches (Fig. 4) an ink jet head comprising a first protective layer (9) for the purpose of preventing the contact of the heating resistor with the ink, which would lead to the oxidation of the heating resistor and/or the decomposition of the ink (col. 7:50-54). Shirato et al. further teaches that the protective layer may be a single layer structure or alternatively, may be composed of plural layers (col. 8:30-32). Therefore, Shirato et al. teaches the a protective layer having a single layer structure and a protective layer having a plural layer structure are art recognized equivalents. Because these two structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a plural layer structure for the single layer structure taught in Shirato et al. ('762).

It would have been an obvious matter of design choice to provide an with upper protective layer being composed of SiN and a lower protective layer being composed of PSG, since the Applicant has not disclosed that this particular combination of passivation materials solves any stated problem or is for any particular purpose and it appears that the invention would function equally well with the passivation layer taught by Shirato et al, as modified.

14. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Murthy et al. (5,658,471).

Shirato et al. teaches the claimed invention with the exception of the heat generating element being composed of polycrystalline silicon.

Murthy et al. teaches that HfB_2 and polysilicon (polycrystalline silicon) are art recognized equivalents for making a heat generating element (col. 7:1-3). Because these two structures were art recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute a polycrystalline silicon heat generating element for the HfB_2 heat generating element taught in Shirato et al. ('762).

15. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shirato et al. (4,339,762) in view of Nakata et al. (EP-764,531), as applied to claims 11, 12, 21/11 and 23 above, and further in view of Matsumoto (4,429,321).

Shirato et al. teaches the claimed invention with the exception of a driving circuit having a plurality of function devices fore driving the heat generating elements provided with the substrate.

Matsumoto teaches an ink jet head comprising an epitaxial layer (119) which is a substrate. The substrate contains a plurality of function elements 911) which drive the heat generating elements (105). Integrating the function devices into the substrate provides the advantage of improving printing speed and recording element density col. 1:26-54).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided in Shirato et al., function elements in the substrate for driving the heat generating elements for the purpose of improving printing speed and density as taught by Matsumoto.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ozaki et al. (5,660,739) teaches a method of producing a substrate whereby a passivation layer of PSG is deposited on a heating resistor, and then is etched away using hydrofluoric acid. A second passivation layer of SiN is then deposited over the first layer and the heating resistor. This reference teaches Applicant's claimed method of forming the passivation layers.

Saito et al. (6,224,191) teaches an ink jet head having a passivation layer formed over a heating resistor, wherein a portion of the passivation layer is etched away to provided a thin portion. Bubble formation starts in the thin portion.

Swinehart et al. (5,367,285) teaches that a TaN resistor has a positive temperature coefficient (col. 7:35-37).

Sanchez-Caldera et al. (5,071,618) teaches that resistors made of transition metal borides, such as HfB₂ have positive temperature coefficients (col. 4:31-33).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael S. Brooke whose telephone number is 703-305-0262. The examiner can normally be reached on 6:30-300 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on 308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3431 for regular communications and 703-305-3431 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

m13

Michael S. Brooke
May 17, 2001


Huan Tran
Primary Examiner